Proof of Concept

Argonne National Laboratory

References

Shared folder: https://share.robotiq.com/public/ccfae

What's included

Argonne_labs.urp : Program used for the proof of concept

Single_test.mkv : A successful run from beginning to end

Repeated_testing.mkv : A serie of parts is assembled as a test

Purpose

The purpose of this proof of concept is to validate that it is possible to install acrylic set screws with a torque sufficient to capture a drop of water, while inferior to the acrylic part breaking point.

Description

We used a vise designed for a press drill to hold the aluminum part securely. A mark was made for proper alignment of the part on the vise.

Program sequence

The sequence goes as follows :

1. Vacuum is activated.
2. The operator is prompted to add a set screw at the tip of the screwdriver.
3. The operator validates the task is accomplished.
4. The screwdriver positions itself on top of the hole.

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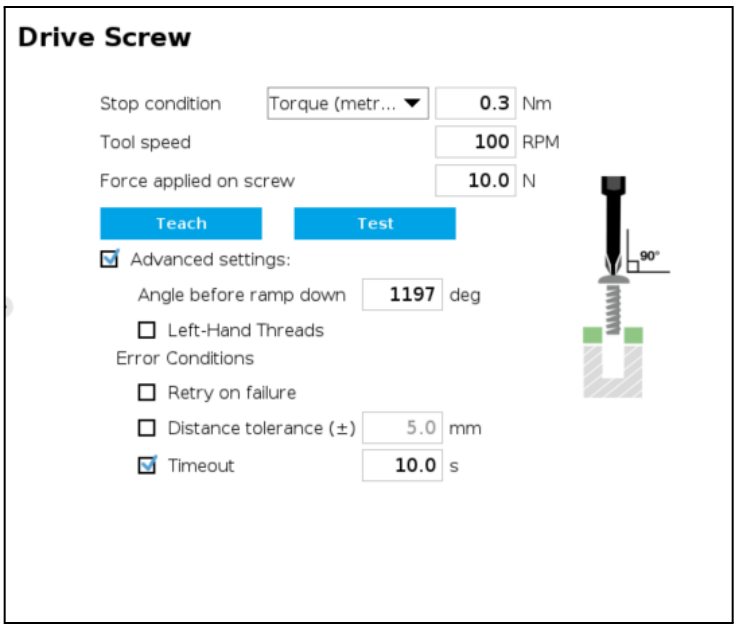
5. Screwdriving sequence and tool retractation.
6. The operator is prompted to flip the part, and to add a set screw.
7. The operator picks the part, flips it, place the drop of water using the pipette, places back the part in the vise, adds a new set screw, and validate.
8. The screwdriver positions itself on top or the hole.
9. Screwdriving sequence and tool retractation.

Screwdriver settings



In order to prevent damage to the set screws, the lowest possible torque value for our system was used, 0.3Nm, along with a 100 RPM rotational speed. In this setting, torque accuracy is rated at +/-15%, so we took the time to assemble the provided extra parts to see if variation could cause breakage. Using a lower speed setting also helps moderate the impact of inertia from the screwdriver's gearbox while helping with torque accuracy. That said, it will be possible to test with increased rotational speed if cycle time becomes a consideration. 10N down force on the tool proved sufficient.

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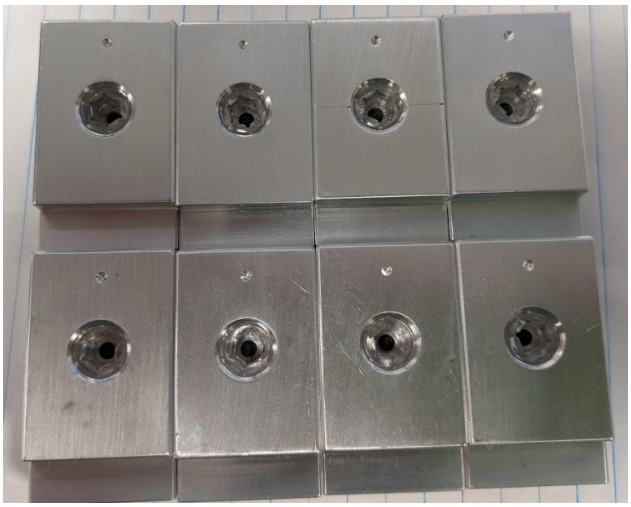
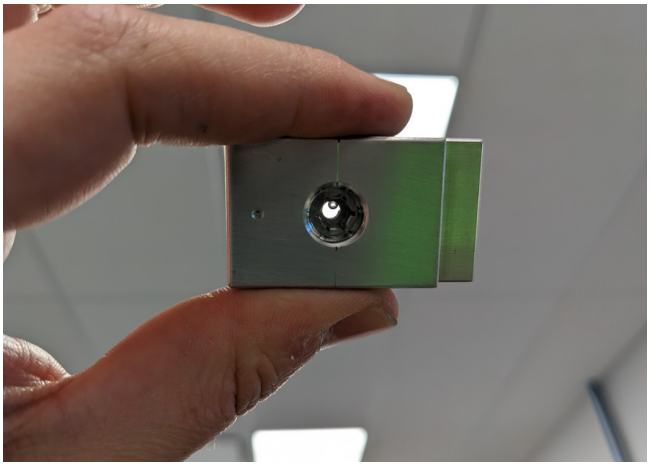
Required adjustment

The screwdriving bit provided by Argonne proved to be a good fit for the B095 vacuum sleeve. It left sufficient space between the bit and the vacuum sleeve for a proper airflow. This way we get reliable screw detection without modification of the hardware provided by Robotiq.

However, the set screw design required to have the screwdriving bit protruding more than for other screw types.

Pictures of finished parts





Results

Proof of concept success: YES

As requested, we tested driving the acrylic set screws provided by Argonne National Laboratory using the lowest possible torque setting (0.3Nm). This torque setting proved to be sufficient to provide a liquid seal for a drop of water dispensed using a pipette. We were able to repeat the process with success using the provided extra parts.

Additional notes : As previously discussed, part presentation was not a part of this proof of concept. This means that the end user has to provide his own part presenting device in order to have a repeatable pick position to get a reliable screwdriving process. Depending on the part presentation system, a combination of screwdriving bit rotation and vacuum may help with picking the very light set screws.

It was also noted that the finishing of the aluminum parts left to be desired; metal chips were found in the hole where the water drop was supposed to be. Those chips can potentially interfere with the final result.

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